

CLAIMS

1. An image heating device comprising:
a heat-generating member comprising a rotatable body having
5 conductivity, and
an exciting coil arranged in opposition to the peripheral surface of the
heat-generating member and adapted for allowing the heat-generating
member to generate heat with electromagnetic induction;
wherein the exciting coil is composed of a bundle of wires having an
10 insulated surface, which are extended in the direction of the rotation axis of
the heat-generating member and circumferentially wound along the
circumferential direction of the heat-generating member, and the bundled
wires extending in the direction of the rotation axis of the heat-generating
member are arranged in close contact with each other in at least one place.
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2. The image heating device according to claim 1, wherein a larger
number of bundled wires are superimposed at both ends than at the central
portion in the direction of the rotation axis of the heat-generating member.
- 20 3. The image heating device according to claim 1, wherein the diameter of
the wire is 0.1 mm or more and 0.3 mm or less and the diameter of the
bundled wire is 5 mm or less.
4. The image heating device according to claim 1, wherein the exciting coil
25 has an inductance of $10 \mu H$ or more and $50 \mu H$ or less and an electric
resistance of 0.5Ω or more and 5Ω or less in a state in which the exciting
coil is opposed to the heat-generating member.
5. The image heating device according to claim 1, further comprising a
30 core made of magnetic material arranged outside the exciting coil.
6. The image heating device according to claim 5, wherein the length of
the core along the direction of the rotation axis of the heat-generating member
is shorter than the length of the heat-generating-member in the direction of
35 the rotation axis thereof.
7. The image heating device according to claim 5, wherein the length of

the exciting coil at the outer peripheral portion in the direction of the rotation axis of the heat-generating member is not shorter than the width of a recording material having the maximum width in all the recording materials to be used; and the length of the core in the direction of the rotation axis of the
5 heat-generating member is not shorter than the width of the recording material having a maximum width of all the recording materials to be used.

8. The image heating device according to claim 5, wherein the distance between the end face of the core and the end face of the heat-generating
10 member in the direction of the rotation axis of the heat-generating member is longer than the facing space between the core and the heat-generating member.

9. The image heating device according to claim 5, wherein the core has
15 opposing portions opposed to the heat-generating member without sandwiching the exciting coil between the opposing portion and the heat-generating member, and magnetic permeable portions opposed to the heat-generating member via the exciting coil.

20 10 The image heating device according to claim 9, wherein the heat-generating member is supported by a support member made of magnetic material, and a space between the support member and the core is twice or more the facing space between the core and the heat-generating member.

25 11. The image heating device according to claim 9, wherein the length between the outermost ends of the magnetic permeable portion along the direction of the rotation axis of the heat-generating member is not longer than the length between the outermost ends of the opposing portion along the direction of the rotation axis of the heat-generating member.

30 12. The image heating device according to claim 9, wherein at least a part of the opposing portion is arranged in closer contact with the heat-generating member than the magnetic permeable portion, thereby forming an adjacent portion.

35 13. The image heating device according to claim 12, wherein a plurality of adjacent portions are provided and one of the plurality of adjacent portions is

located in the center of the winding of the exciting coil.

14. The image heating device according to claim 5, wherein at least a part
of the core has gaps in the direction of the rotation axis of the heat-generating
5 member.

15. The image heating device according to claim 14, wherein the core has
opposing portions opposed to the heat-generating member without
sandwiching the exciting coil between the opposing portion and the heat-
10 generating member, and magnetic permeable portions opposed to the heat-
generating member via the exciting coil, and the gaps in the magnetic
permeable portion of the core are distributed nonuniformly in the direction of
the rotation axis of the heat-generating member.

15 16. The image heating device according to claim 15, wherein the gap in the
magnetic permeable portion of the core is smaller in the end portion than in
the central portion in the direction of the rotation axis of the heat-generating
member.

20 17. The image heating device according to claim 14, wherein the core has
opposing portions opposed to the heat-generating member without
sandwiching the exciting coil between the opposing portion and the heat-
generating member, and magnetic permeable portions opposed to the heat-
generating member via the exciting coil, and the opposing portions of the core
25 are arranged asymmetrically with respect to a center line of the exciting coil
in the direction of the rotation axis of the heat-generating member.

18. The image heating device according to claim 14, wherein the core has
opposing portions opposed to the heat-generating member without
30 sandwiching the exciting coil between the opposing portion and the heat-
generating member, and magnetic permeable portions opposed to the heat-
generating member via the exciting coil, and the gap in the opposing portion
of the core is smaller than the gap in the magnetic permeable portion of the
core in the direction of the rotation axis of the heat-generating member.

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19. The image heating device according to claim 14, wherein the core has
opposing portions opposed to the heat-generating member without

sandwiching the exciting coil between the opposing portion and the heat-generating member, and magnetic permeable portions opposed to the heat-generating member via the exciting coil, and the opposing portions of the core are provided continuously in the direction of the rotation axis of the heat-generating member.

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20. The image heating device according to claim 5, wherein the heat-generating member is formed in the shape of pipe, and the cross-sectional area of the surface of the inside of the heat-generating member perpendicular to the rotation axis thereof is smaller than the maximum cross sectional area of the core and exciting coil.

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21. The image heating device according to claim 5, wherein a part of the core is divided, thereby forming a movable portion and the movable portion is held movably with respect to the remaining portion of the core.

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22. The image heating device according to claim 21, wherein the movable portion is arranged outside the region in which a recording material to be used passes through and is allowed to be movable with respect to the remaining portion of the core.

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23. The image heating device according to claim 1, further comprising a shielding member made of conductive material covering at least a part of a rear face of the exciting coil.

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24. The image heating device according to claim 1, further comprising a cooling means for cooling the exciting coil by air flow.

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25. The image heating device according to claim 1, further comprising a heat insulating member for shielding a thermal conduction between the exciting coil and the heat-generating member.

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26. The image heating device according to claim 25, further comprising a core made of magnetic material arranged outside the exiting coil, wherein the length of the exciting coil along the direction of the rotation axis of the heat-generating member is shorter than the length of the heat insulating member along the direction of the rotation axis of the heat-generating member and is

longer than the length of the core along the direction of the rotation axis of the heat-generating member.

27. The image heating device according to claim 1, further comprising a fixing roller and a fixing belt suspended between the fixing roller and the heat-generating member.
28. The image heating device according to claim 27, further comprising a core made of magnetic material arranged outside the exiting coil, wherein the core has opposing portions opposed to the heat-generating member without sandwiching the exciting coil between the opposing portion and the heat-generating member, and magnetic permeable portions opposed to the heat-generating member via the exciting coil, and the length between the outermost ends of the opposing portion along the direction of the rotation axis of the heat-generating member is not longer than the width of the fixing belt.
29. An image heating device comprising:
 - a heat-generating member comprising a rotatable body having conductivity, and
 - an exciting coil arranged in opposition to the peripheral surface of the heat-generating member and adapted for allowing the heat-generating member to generate heat with electromagnetic induction;
 - wherein the exciting coil composed of a bundle of wires having an insulated surface, which are extended in the direction of the rotation axis of the heat-generating member and circumferentially wound along the circumferential direction of the heat-generating member, and a larger number of bundled wires are superimposed at both ends than at the central portion in the direction of the rotation axis of the heat-generating member.
30. An image heating device comprising:
 - a heat-generating member comprising a rotatable body having conductivity, and
 - an exciting coil arranged in opposition to the peripheral surface of the heat-generating member and adapted for allowing the heat-generating member to generate heat with electromagnetic induction;
 - further comprising a core made of magnetic material arranged outside the exiting coil, and the length of the core along the direction of the rotation

axis of the heat-generating member is not shorter than the width of a recording material having the maximum width of all the recording materials to be used.

- 5 31. An image heating device comprising:
 a heat-generating member comprising a rotatable body having conductivity; and
 an exciting coil arranged in opposition to the peripheral surface of the heat-generating member and adapted for allowing the heat-generating member to generate heat with electromagnetic induction;
- 10 further comprising a core made of magnetic material arranged in a state in which the exciting coil is sandwiched between the core and the heat-generating member, the core has opposing portions opposed to the heat-generating member without sandwiching the exciting coil between the opposing portion and the heat-generating member, and magnetic permeable portions opposed to the heat-generating member via the exciting coil,
- 15 wherein at least a part of the opposing portion is arranged in closer contact with the heat-generating member than the magnetic permeable portion, thereby forming an adjacent portion, and at least a part of the core has gaps in the direction of the rotation axis of the heat-generating member.
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32. An image heating device comprising:
 a heat-generating member comprising a rotatable body having conductivity; and
 an exciting coil arranged in opposition to the peripheral surface of the heat-generating member and adapted for allowing the heat-generating member to generate heat with electromagnetic induction;
- 25 further comprising a core made of magnetic material arranged in a state in which the exciting coil is sandwiched between the core and the heat-generating member, the core has opposing portions opposed to the heat-generating member without sandwiching the exciting coil between the opposing portion and the heat-generating member, and magnetic permeable portions opposed to the heat-generating member via the exciting coil,
- 30 wherein the area of the portion where the opposing portion is opposed to the heat-generating member is larger than the cross sectional area of the magnetic permeable portion perpendicular to the circumferential direction of the heat-generation member.
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33. An image heating device comprising:
a heat-generating member comprising a rotatable body having conductivity; and
5 an exciting coil arranged in opposition to the peripheral surface of the heat-generating member and adapted for allowing the heat-generating member to generate heat with electromagnetic induction;
further comprising a core made of magnetic material arranged in a state in which the exciting coil is sandwiched between the core and the heat-generating member,
10 wherein a part of the core is divided, thereby forming a movable portion and the movable portion is held movably with respect to the remaining portion of the core.
- 15 34. An image heating device comprising:
a fixing belt,
a pressure means that is pressed against the fixing belt to form a nip portion on the right side of the fixing belt,
a heat-generating roller having at least a part composed of a conductive member and movably suspending the fixing belt, and
20 an exciting coil arranged in opposition to the peripheral surface of the heat-generating roller via the fixing belt and adapted for allowing the heat-generating roller to generate heat by exciting the portion where the heat-generating roller is in contact with the fixing belt.
25 35. The image heating device according to claim 34, wherein the width of excitation in the direction in which the fixing belt moves is substantially the same as or not more than the width of the portion where the fixing belt is in contact with the heat-generating roller.
30 36. The image heating device according to claim 34, further comprising a temperature detecting means for detecting the temperature, which is arranged in contact with the surface of the heat-generating roller at a portion other than a portion where the heat-generating roller is in contact with the fixing belt; and a control means for controlling an output from the exciting coil in accordance with an output from the temperature detecting means.
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37. The image heating device according to claim 34, wherein an exciting current having a predetermined frequency is applied to the exciting coil, and the conductive member of the heat-generating roller has a thickness equal to or larger than the skin depth defined by the material thereof and the
5 predetermined frequency.
38. An image heating device comprising:
a fixing belt;
a pressure means that is pressed against the fixing belt to form a nip
10 portion on the right side of the fixing belt,
a heat-generating roller made of magnetic material whose Curie temperature is set to be a predetermined value and movably suspending the fixing belt;
a conductive member provided inside the heat-generating roller; and
15 an exciting coil arranged in opposition to the peripheral surface of the heat-generating roller via the fixing belt and adapted for allowing the heat-generating roller to generate heat by exciting the portion where the heat-generating roller is in contact with the fixing belt.
- 20 39. The image heating device according to claim 38, wherein the conductive member is arranged adiabatically with respect to the heat-generating roller.
40. The image heating device according to claim 38, wherein an exciting current having a predetermined frequency is applied to the exciting coil, and
25 the heat-generating roller has a thickness equal to or larger than the skin depth defined by the material thereof and the predetermined frequency.
41. An image forming apparatus comprising:
an image forming means for forming an unfixed image onto a recording
30 material and having the unfixed image carried thereon; and
a fixing device for fixing the unfixed image onto the recording material,
wherein an image heating device according to any one of claims 1 to 40
is used as the fixing device.